

What is Claimed is:

1        1. A temperature sensing device for measuring temperature of a fluid at various  
2 locations along an intravenous fluid line extending between a fluid source and a patient, said  
3 device comprising:

4              a housing member selectively securable to said fluid line at any of a plurality of fluid line  
5 locations between said fluid source and said patient, wherein said housing member includes a  
6 receptacle to receive and retain a portion of said fluid line corresponding to one of said plurality  
7 of fluid line locations selected by an operator and to allow said fluid line to extend continuously  
8 through said housing member, and wherein said plurality of fluid line locations includes at least  
9 one proximal fluid line location toward said fluid source and at least one distal fluid line location  
10 toward said patient; and

11              a temperature sensor disposed proximate said receptacle to measure temperature of fluid  
12 within said retained fluid line portion and to generate a temperature signal indicating said  
13 measured fluid temperature to facilitate display of said measured fluid temperature.

1        2. The sensing device of claim 1 further comprising:

2              a temperature monitor in communication with said temperature sensor to receive said  
3 temperature signal and display said fluid temperature measured by said temperature sensor.

1        3. The temperature sensing device of claim 2, wherein said temperature monitor  
2 includes a hand-held display device.

1        4. The temperature sensing device of claim 1, wherein said housing member is  
2 slidable along said fluid line upon receiving and retaining said selected fluid line portion to allow  
3 fluid temperature measurements at any of said plurality of fluid line locations.

1        5. The temperature sensing device of claim 1 further comprising:

2              a cover member connected and movable with respect to said housing member to control  
3 access to said receptacle.

1        6.     The temperature sensing device of claim 1, wherein said receptacle includes a  
2 channel with a sensor receiving area that secures said temperature sensor within said housing  
3 member and a tapered section configured to releasably engage said selected fluid line portion  
4 received within said receptacle.

1        7.     The temperature sensing device of claim 1 further comprising:  
2              a plurality of resilient prongs extending from said housing member and configured to  
3 receive and releasably retain said temperature sensor proximate said receptacle.

1        8.     The temperature sensing device of claim 7, wherein each of said prongs includes  
2 a transversely extending projection, each projection extending a selected distance toward the other  
3 projection to engage and releasably retain said temperature sensor between said prongs.

1        9.     The temperature sensing device of claim 1, wherein said housing member further  
2 includes a platform including an engaging surface to engage a body part of said patient.

1        10.    The temperature sensing device of claim 1, wherein said temperature sensor  
2 includes a sensing tip disposed within said receptacle to pierce a wall of said selected fluid line  
3 portion and directly measure temperature of fluid flowing through that portion.

1        11.    The temperature sensing device of claim 10, wherein said housing member further  
2 includes an upper member pivotally connected to a lower member, each of said upper and lower  
3 members includes a groove disposed on an engaging surface, and said grooves of said upper and  
4 lower members are aligned on said engaging surfaces to form said receptacle in the form of a  
5 channel upon contact between said engaging surfaces.

1        12.    The temperature sensing device of claim 11, wherein said engaging surfaces  
2 include a locking mechanism to lock said upper member against said lower member.

1        13.     The temperature sensing device of claim 1, wherein said housing member includes  
2 a resilient member arranged in a spiral configuration with first and second resilient member ends  
3 overlapping each other and separated by a gap.

1        14.     A temperature sensing device for measuring temperature of a fluid flowing within  
2 an intravenous fluid line at selected locations along said fluid line, said device comprising:  
3        a fitting including:

4              first and second open ends each securable to selected portions of said fluid line;  
5              a passage disposed within said fitting and extending between said first and second  
6 open ends to permit fluid flowing within said fluid line to flow through said fitting; and  
7              a connection port disposed on an exterior surface of said fitting and in fluid  
8 communication with said passage; and

9              a temperature sensor disposed within said connection port to measure temperature of fluid  
10 flowing through said fitting and to generate a temperature signal indicating said measured fluid  
11 temperature to facilitate electronic display of said measured fluid temperature.

1        15.     The sensing device of claim 14 further comprising:  
2        a temperature monitor in communication with said temperature sensor to receive said  
3 temperature signal and electronically display said fluid temperature measured by said temperature  
4 sensor.

1        16.     The temperature sensing device of claim 15, wherein said temperature monitor  
2 includes a hand-held display device.

1        17.     The temperature sensing device of claim 14, wherein said temperature sensor  
2 directly contacts fluid flowing within said passage.

1        18.     The temperature sensing device of claim 14 further comprising:  
2        a receptacle disposed within said connection port to directly contact fluid flowing within  
3 said passage, wherein said temperature sensor is removably received within and contacts said  
4 receptacle.

1        19.     The temperature sensing device of claim 18, wherein said connection port extends  
2 from an outer surface of said fitting and said device further comprises:

3              a securing member to secure said temperature sensor to said connection port, wherein said  
4 securing member includes a recess defined therein and said temperature sensor is disposed within  
5 said recess and extends to contact said receptacle when said securing member is secured to said  
6 connection port.

1        20.     The temperature sensing device of claim 19, wherein said securing member and  
2 said connection port include a locking mechanism to releasably secure said securing member to  
3 said connection port and to facilitate contact between said temperature sensor and said receptacle.

1        21.     The temperature sensing device of claim 20, wherein said locking mechanism  
2 includes:

3              at least one projection removably attached to an outer surface of said connection port; and  
4              at least one engagement member disposed on said securing member to engage a  
5 corresponding projection;

6              wherein said at least one engagement member is configured to remove said corresponding  
7 projection from said connection port in response to disengagement of said securing member with  
8 said connection port to thereby prevent re-engagement of said connection port with said securing  
9 member and re-use of said fitting.

1        22.     The temperature sensing device of claim 14, wherein said connection port includes  
2 a flexible membrane to seal an opening in said connection port from said passage, and said  
3 temperature sensor includes a sensing tip configured to penetrate said flexible membrane and  
4 directly measure temperature of fluid flowing within said passage.

1        23.     A method of measuring temperature of a fluid at various locations along an  
2 intravenous fluid line extending between a fluid source and a patient via a temperature sensing  
3 device including a receptacle to receive and retain a portion of said fluid line and to allow said  
4 fluid line to extend continuously through said temperature sensing device and a temperature

5 sensor to measure temperature of fluid within said retained fluid line portion, said method  
6 comprising the steps of:

7       (a) determining a desired location along said fluid line residing at any of a plurality  
8 of fluid line locations between said fluid source and said patient from which to measure  
9 temperature of said fluid;

10      (b) selectively securing said temperature sensing device to a portion of said fluid line  
11 corresponding to said desired location, wherein said temperature sensing device is selectively  
12 securable to said fluid line at any of said plurality of fluid line locations and said plurality of fluid  
13 line locations includes at least one proximal fluid line location toward said fluid source and at  
14 least one distal fluid line location toward said patient;

15      (c) measuring a temperature of fluid flowing through said selected portion of said fluid  
16 line via said temperature sensor; and

17      (d) displaying the measured temperature via a temperature monitor in communication  
18 with said temperature sensor.

1       24. The method of claim 23, wherein step (b) further includes:

2       (b.1) sliding said temperature sensing device along said fluid line to said desired fluid  
3 line portion.

1       25. The method of claim 23, wherein step (b) further includes:

2       (b.1) inserting said desired fluid line portion through an opening in said temperature  
3 sensing device and into said receptacle; and

4       (b.2) securing said desired fluid line portion within said receptacle by moving a cover  
5 member secured to said temperature sensing device to close said opening.

1       26. The method of claim 25, wherein step (b.1) further includes:

2       (b.1.1) securing said desired fluid line portion within said temperature sensing device via  
3 a tapered section of said receptacle.

1        27. The method of claim 23, wherein said temperature sensing device includes a  
2 plurality of resilient prongs and said receptacle is disposed on said temperature sensing device  
3 between said resilient prongs, and step (b) further includes:

4            (b.1) inserting said desired fluid line portion between said prongs and into said  
5 receptacle; and

6            (b.2) inserting said temperature sensor between said prongs to secure said temperature  
7 sensor proximate said desired fluid line portion.

1        28. The method of claim 27, wherein each of said prongs includes a transversely  
2 extending projection, and step (b.2) further includes:

3            (b.2.1) engaging said temperature sensor with said projections to retain said temperature  
4 sensor between said prongs.

1        29. The method of claim 23, wherein step (b) further includes:

2            (b.1) securing said temperature sensing device to a body part of said patient.

1        30. The method of claim 23, wherein said temperature sensor includes a sensing tip  
2 disposed within said receptacle, and step (b) further includes:

3            (b.1) piercing a wall of said desired fluid line portion with said sensing tip; and  
4 step (c) further includes:

5            (c.1) directly measuring the temperature of fluid flowing through said desired fluid line  
6 portion with said sensing tip.

1        31. The method of claim 30, wherein said temperature sensing device further includes  
2 an upper member pivotally connected to a lower member, each of said upper and lower members  
3 includes a groove disposed on an engaging surface, and said grooves of said upper and lower  
4 members are aligned on said engaging surfaces to form said receptacle in the form of a channel  
5 upon contact between said engaging surfaces, and step (b.1) further includes:

6            (b.1.1) inserting said desired fluid line portion into said groove on said engaging surface  
7 of said lower member; and

8           (b.1.2) pivoting at least one of said upper and lower members with respect to the other of  
9 said upper and lower members to contact said engaging surfaces of said upper and lower members  
10 and force said sensing tip to pierce said wall of said desired fluid line portion.

1           32.     The method of claim 31, wherein said engaging surfaces include a locking  
2 mechanism, and step (b.1.2) further includes:

3           (b.1.2.1)   locking said upper member against said lower member.

1           33.     The method of claim 23, wherein said temperature sensing device further includes  
2 a resilient member arranged in a spiral configuration with first and second resilient member ends  
3 overlapping each other and separated by a gap, and step (b) further includes:

4           (b.1)   inserting said desired fluid line portion within said gap; and

5           (b.2)   directing said desired fluid line portion through said gap to be received and secured  
6 within said receptacle.

1           34.     A method of measuring temperature of a fluid flowing within an intravenous fluid  
2 line at selected locations along said fluid line via a temperature sensing device including a fitting  
3 including first and second open ends, a passage disposed within said fitting and extending  
4 between said first and second open ends to permit fluid flowing within said fluid line to flow  
5 through said fitting and a connection port disposed on an exterior surface of said fitting and in  
6 fluid communication with said passage, and a temperature sensor to measure temperature of fluid  
7 flowing through said fitting, said method comprising the steps of:

8           (a)   securing said first and second ends of said fitting to selected portions of said fluid  
9 line;

10          (b)   measuring a temperature of fluid flowing through said fitting via said temperature  
11 sensor and generating a temperature signal indicating said measured fluid temperature to facilitate  
12 electronic display of said measured fluid temperature; and

13          (c)   electronically displaying the temperature measured by said temperature sensor via  
14 a display device.

1           35.     The method of claim 34, wherein step (b) further includes:

2           (b.1) measuring the fluid temperature by directly contacting said temperature sensor with  
3 fluid flowing through said fitting.

1           36. The method of claim 34, wherein said fitting further includes a receptacle disposed  
2 within said connection port and in direct contact with fluid flowing within said passage, and step  
3 (b) further includes:

4           (b.1) inserting said temperature sensor within said connection port to contact said  
5 receptacle; and

6           (b.2) measuring the temperature of said receptacle to indirectly determine the  
7 temperature of fluid flowing within said fitting.

1           37. The method of claim 36, wherein said connection port extends from an outer  
2 surface of said fitting, said temperature sensing device further includes a securing member to  
3 secure said temperature sensor to said connection port, wherein said securing member includes  
4 a recess defined therein and said temperature sensor is disposed within said recess, and step (b.1)  
5 further includes:

6           (b.1.1) securing said temperature sensor to said connection port via said securing member,  
7 wherein said temperature sensor is positioned in contact with said receptacle.

1           38. The method of claim 37, wherein said securing member and said connection port  
2 include a locking mechanism to releasably secure said securing member to said connection port,  
3 and step (b.1.1) further includes:

4           (b.1.1.1) locking said securing member to said connection port by disposing said  
5 connection port within said recess to enable said temperature sensor to contact said receptacle.

1           39. The method of claim 38, wherein said locking mechanism includes at least one  
2 projection removably attached to an outer surface of said connection port and at least one  
3 engagement member disposed on said securing member to engage a corresponding projection, and  
4 said method further comprises:

5           (d) removing said at least one projection from said connection port via said  
6 corresponding engagement member in response to disengagement of said securing member with

7 said connection port to thereby prevent re-engagement of said connection port with said securing  
8 member and re-use of said fitting.

1        40.     The method of claim 34, wherein said connection port includes a flexible  
2 membrane to seal an opening in said connection port from said passage and said temperature  
3 sensor includes a sensing tip, and step (b) further includes:

4              (b.1) penetrating said flexible membrane with said sensing tip to insert said sensing tip  
5 into said channel; and

6              (b.2) directly measuring the temperature of fluid flowing through said fitting with said  
7 sensing tip.

1        41.     A temperature sensing device for measuring temperature of a fluid at various  
2 locations along an intravenous fluid line extending between a fluid source and a patient, said  
3 device comprising:

4              housing means for engaging said fluid line and selectively securable to said fluid line at  
5 any of a plurality of fluid line locations between said fluid source and said patient, wherein said  
6 housing means includes receiving means for receiving and retaining a portion of said fluid line  
7 corresponding to one of said plurality of fluid line locations selected by an operator and for  
8 allowing said fluid line to extend continuously through said housing means, and wherein said  
9 plurality of fluid line locations includes at least one proximal fluid line location toward said fluid  
10 source and at least one distal fluid line location toward said patient; and

11          temperature sensing means disposed proximate said receiving means for measuring  
12 temperature of fluid within said retained fluid line portion and generating a temperature signal  
13 indicating said measured fluid temperature to facilitate display of said measured fluid temperature.

1        42.     The temperature sensing device of claim 41 further comprising:

2              display means in communication with said temperature sensing means for receiving said  
3 temperature signal and displaying said fluid temperature measured by said temperature sensing  
4 means.

1        43.    The temperature sensing device of claim 41, wherein said housing means is  
2    slidable along said fluid line upon receiving and retaining said selected fluid line portion to allow  
3    fluid temperature measurements at any of said plurality of fluid line locations.

1        44.    The temperature sensing device of claim 41 further comprising:  
2              cover means connected and movable with respect to said housing means for controlling  
3    access to said receiving means.

1        45.    The temperature sensing device of claim 41, wherein said device further comprises:  
2              resilient means extending from said housing means for receiving and releasably retaining  
3    said temperature sensing means proximate said receiving means.

1        46.    The temperature sensing device of claim 41, wherein said housing means further  
2    includes patient means for engaging a body part of said patient.

1        47.    The temperature sensing device of claim 41, wherein said temperature sensing  
2    means includes line sensing means disposed within said receiving means for piercing a wall of  
3    said selected fluid line portion and directly measuring temperature of fluid flowing through that  
4    portion.

1        48.    The temperature sensing device of claim 47, wherein said housing means further  
2    includes an upper member pivotally connected to a lower member, each of said upper and lower  
3    members includes a groove disposed on an engaging surface, and said grooves of said upper and  
4    lower members are aligned on said engaging surfaces to form said receiving means in the form  
5    of a channel upon contact between said engaging surfaces.

1        49.    The temperature sensing device of claim 48, wherein said engaging surfaces  
2    include locking means for locking said upper member against said lower member.

1        50.     The temperature sensing device of claim 41, wherein said housing means includes  
2 a resilient member arranged in a spiral configuration with first and second resilient member ends  
3 overlapping each other and separated by a gap.

1        51.     A temperature sensing device for measuring temperature of a fluid flowing within  
2 an intravenous fluid line at selected locations along said fluid line, said device comprising:  
3              connector means for permitting fluid flow therethrough, said connector means including:  
4                  first and second open ends each securable to selected portions of said fluid line;  
5                  flow means disposed within said connector means and extending between said first  
6 and second open ends for permitting fluid flowing within said fluid line to flow through said  
7 connector means; and  
8                  fluid access means disposed on an exterior surface of said connector means and  
9 in fluid communication with said flow means; and  
10                temperature sensing means disposed within said fluid access means for measuring  
11 temperature of fluid flowing through said connector means and for generating a temperature signal  
12 indicating said measured fluid temperature to facilitate electronic display of said measured fluid  
13 temperature.

1        52.     The temperature sensing device of claim 51 further comprising:  
2              display means in communication with said temperature sensing means for receiving said  
3 temperature signal and electronically displaying said fluid temperature measured by said  
4 temperature sensing means.

1        53.     The temperature sensing device of claim 51, wherein said temperature sensing  
2 means directly contacts fluid flowing within said flow means.

1        54.     The temperature sensing device of claim 51 further comprising:  
2              cover means disposed within said fluid access means to directly contact fluid flowing  
3 within said flow means, wherein said temperature sensing means is removably received within  
4 and contacts said cover means.

1        55. The temperature sensing device of claim 54, wherein said fluid access means  
2 extends from an outer surface of said connector means and said device further comprises:  
3            securing means for securing said temperature sensing means to said fluid access means,  
4 wherein said securing means includes a recess defined therein and said temperature sensing means  
5 is disposed within said recess and extends to contact said cover means when said securing means  
6 is secured to said fluid access means.

1        56. The temperature sensing device of claim 55, wherein said securing means and said  
2 fluid access means include locking means for releasably securing said securing means to said fluid  
3 access means and for facilitating contact between said temperature sensing means and said cover  
4 means.

1        57. The temperature sensing device of claim 56, wherein said locking means includes:  
2            projection means removably attached to an outer surface of said fluid access means for  
3 securing said securing means to said fluid access means; and  
4            engagement means disposed on said securing means for engaging a corresponding  
5 projection means for securing said securing means to said fluid access means;  
6            wherein said engagement means removes said corresponding projection from said fluid  
7 access means in response to disengagement of said securing means with said fluid access means  
8 to thereby prevent re-engagement of said fluid access means with said securing means and re-use  
9 of said connector means.

1        58. The temperature sensing device of claim 51, wherein said fluid access means  
2 includes barrier means for sealing an opening in said fluid access means from said flow means,  
3 and said temperature sensing means includes penetrating sensing means for penetrating said  
4 barrier means and directly measuring temperature of fluid flowing within said flow means.